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Dalbergia (Leguminosae) of Borneo

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Twenty one species of *Dalbergia* are recognized in Borneo including four new species and three newly recorded species. The new species are *D. bintuluensis* Sunarno & H. Ohashi found in Sarawak, *D. kostermansii* Sunarno & H. Ohashi in Kalimantan and Sarawak, *D. richardsii* Sunarno & H. Ohashi in Sarawak, and *D. sandakanensis* Sunarno & H. Ohashi in Sabah. Three species new to Borneo are *D. canescens* Merrill and *D. mimosella* (Blanco) Prain, both previously known in the Philippines, and *D. hullettii* Prain in Singapore. *Dalbergia phyllanthoides* Blume ex Miq. is regarded to be a new synonym of *D. junghuhnii* Benth. Of the 21 species following eight (38% for total species of *Dalbergia* in Borneo) are endemic to Borneo, i. e., *D. bintuluensis*, *D. borneensis*, *D. falcata*, *D. havilandii*, *D. hoseana*, *D. kostermansii*, *D. richardsii*, and *D. sandakanensis*. A key to all the species and an enumeration of species with their correct names, synonyms, bibliography, distribution, habitat and ecology, vernacular names, a list of specimens examined, and taxonomic notes are presented.

Introduction

Prain (1901, 1904) recorded 14 species of *Dalbergia* from Borneo (Tab. 1), of which five, i.e., *D. beccarii*, *D. borneensis*, *D. falcata*, *D. havilandii*, and *D. hoseana*, are thought to be endemic to this island. This is the only comprehensive work on *Dalbergia* of Borneo. Merrill (1921) added two species including one new species. At present, these 16 species are known to occur in Borneo, but, studies on the genus of Borneo are still incomplete. In this study 21 species (Tab. 1) are recognized based mainly on examination of herbarium specimens accumulated mostly in BO, K, and L. Four new species, i. e., *D. bintuluensis*, *D. kostermansii*, *D. richardsii* and *D. sandakanensis*, and three species newly found from Borneo of which two have been known in the Philippines, i. e., *D. canescens* and *D. mimosella*, and one, *D. hullettii* Prain, in Singapore are included. Two species recorded by Merrill (1921) from Borneo, i. e., *D. simplicifolia* and *D. subalternifolia*, are reduced to synonyms of *D. rostrata* as treated in our previous paper (Sunarno and Ohashi 1996). *Dalbergia phyllanthoides* Blume ex Miq. is regarded here to be a new synonym of *D. junghuhnii* Benth.

Of the 21 species eight are endemic to Borneo (38% for total species of *Dalbergia* in Borneo). Comparing the present result with our previous work on *Dalbergia* of Sulawesi, where seven species are recorded including one endemic species, *D. teijsmannii*, (14% for total species), Borneo is distinctly richer than Sulawesi in total number of species, endemic species, and ratio of endemic species to total species. Species common to both islands are six (*Dalbergia candenatensis*, *D. discolor*, *D. ferruginea*, *D. rostrata*, *D. pinnata*, and *D.*

Table 1. *Dalbergia* of Borneo recognized by Prain (1904) and the present study

Prain (1904)		Present study (*Endemic species)
1. *D. beccarii*	=	1. *D. beccarii* Prain
		2. *D. bintuluensis* Sunarno & H. Ohashi*
2. *D. borneensis*	=	3. *D. borneensis* Prain*
13. *D. torta*	→	4. *D. candenatensis* (Dennst.) Prain
		5. *D. canescens* (Elmer) Merrill
3. *D. discolor*	=	6. *D. discolor* Blume ex Miq.
4. *D. falcata*	=	7. *D. falcata* Prain*
5. *D. ferruginea*	=	8. *D. ferruginea* Roxb.
6. *D. havilandii*	=	9. *D. havilandii* Prain*
7. *D. hoseana*	=	10. *D. hoseana* Prain*
		11. *D. hullettii* Prain
9. *D. phyllanthoides*	→	12. *D. junghuhnii* Benth.
		13. *D. kostermansii* Sunarno & H. Ohashi*
		14. *D. mimosella* (Blanco) Prain
8. *D. parviflora*	=	15. *D. parviflora* Roxb.
12. *D. tamarindifolia*	→	16. *D. pinnata* (Lour.) Prain
		17. *D. richardsii* Sunarno & H. Ohashi*
10. *D. rostrata*	=	18. *D. rostrata* hassk.
		19. *D. sandakanensis* Sunarno & H. Ohashi*
11. *D. scortechinii*	=	20. *D. scortechinii* (Prain) Prain
14. *D. velutina*	=	21. *D. velutina* Benth.

mimosella).

In this paper, Borneo, following Hollis and Brummitt (1992), is divided into four regions as Brunei, Kalimantan (=Indonesian Borneo), Sabah, and Sarawak for distribution and citation of specimens examined. Specimens examined in this study are kept in A & GH, BO, K, KEP, L, MO, OXF, and TUS.

Key to the species

1. Leafless when flowering . 11. *D. hullettii*
1. Leaves present when flowering 2
2. Leaflets small, usually less than 3.5 cm long 3
2. Leaflets medium to relatively large, usually more than 4.5 cm long 12
3. Stipules persistent to subpersistent on old branches 4
3. Stipules caducous even on young branches 7
4. Leaflets 5–9(–11), obtuse at apex, membranous; petiolules 5–8 mm long .... 3. *D. borneensis*
4. Leaflets 9–25(–41), emarginate, mucronulate or not at apex, chartaceous to coriaceous; lateral ones oblique at base; petiolules 0.5–2 mm long 5
5. Leaflets 25–41, 10–20 mm long; mucronulate at apex; petiolules 0.5–1 mm long; lateral nerves 6–7 pairs .... 16. *D. pinnata*
5. Leaflets 9–25, 20–45(–50) mm long; obtuse or emarginate at apex; petiolules 1–5 mm long; lateral nerves 7–15 pairs 6
6. Leaflets emarginate at apex; petiolules usually less than 2 mm long; nerves usually less than 10 pairs; climbers ....

.... 8. *D. ferruginea*

6. Leaflets obtuse at apex; petiolules usually more than 2 mm long; lateral nerves usually more than 10 pairs; trees .... 14. *D. mimosella*

7. Stipules broadly falcate. Pods entirely thickened, slightly reniform .... 1. *D. beccarii*

7. Stipules suborbicular, ovate, triangular ovate or lanceolate. Pods samaroid 8

8. Leaflets hairy on both surfaces, densely tomentose beneath 9

8. Leaflets glabrous or hairy along the midrib above, appressed short hairy beneath 11

9. Leaflets 20–30 mm long; lateral nerves 6–9 pairs. Stipules ovate to lanceolate, 5–10 mm long .... 5. *D. canescens*

9. Leaflets 10–20 mm long; lateral nerves inconspicuous. Stipules suborbicular or triangular ovate, smaller, usually less than 5 mm long 10

10. Leaflets 9–11(–13), greenish when dry, 10–15 mm long; apex with a tuft of hairs at top. Stipules triangular ovate, acuminate, ca. 2.5 mm long, 2 mm wide .... 10. *D. hoseana*

10. Leaflets 11–17, blackish brown when dry, 18–20 mm long; apex without a tuft of hairs. Stipules suborbicular, acute, ca. 1 mm long, 0.5–0.8 mm wide .... 19. *D. sandakanensis*

11. Terminal leaflets glabrous above, oblique at base. Flowers 3–4 mm long. Standard obovate, 3–3.5 mm long 12. *D. junghuhnii*

11. Terminal leaflets sparsely to densely hairy along the midrib above, equal to base. Flowers 2.5–3 mm long. Standard orbicular, 2.5–2.8 mm long .... 20. *D. scortechinii*

12. Leaflets 13–17. Stipules large, 15–20 cm long .... 21. *D. velutina*

12. Leaflets 3–11. Stipules smaller, usually less than 10 mm long 13

13. Leaves mostly with 3–5(–7) leaflets or sometimes mixed with unifoliolate leaves 14

13. Leaflets mostly 5–9, sometimes 3 or 11 18

14. Leaflets always 3–5, rarely 7 15

14. Leaflets usually 3–5 but sometimes with unifoliolate leaves 17

15. Leaflets large, usually more than 5 cm long, acute at apex; petioles 2–3 cm long .... 18. *D. richardsii*

15. Leaflets smaller, usually less than 5 cm long, cuspidate at apex; petioles up to 2 cm long 16

16. Leaflets 5–7, apex mucro-nulate. Pods foveolate in mature, 3–4 cm long, 2–3 cm wide, base decurrent .... 13. *D. kostermansii*

16. Leaflets 3–5, apex not mucronulate. Pods alveolate in mature, 5–6 cm long, 3–4 cm wide, base not decurrent .... 2. *D. bintuluensis*

17. Leaflets apiculate, acuminate or sometimes acute at apex, brown when dry .... 9. *D. havilandii*

17. Leaflets slightly cuspidate or rostrate at apex, dark reddish brown or blackish when dry .... 17. *D. rostrata*

18. Leaves 3–8 cm long; lateral nerves 4–6 pairs. In the vicinity of mangrove vegetation, on the beach or in the bank of tidal river .... 4. *D. candenatensis*

18. Leaves 10–25 cm long, lateral nerves 5–11 pairs. In lowland to hill forests 19

19. Petioles 4–10 cm long; lateral nerves 5–7 pairs. Flowers large, 8–9 mm long .... 7. *D. falcata*

19. Petioles 2–4 cm long; lateral nerves 7–11 pairs. Flowers small, 3–3.5 mm long .. 20

20. Leaves 15–25 cm long. Leaflets oblong, sometimes ovate to slightly obovate. Pods entirely thickened, surface torulose, blackish brown to black when dry .... 16. *D. parviflora*

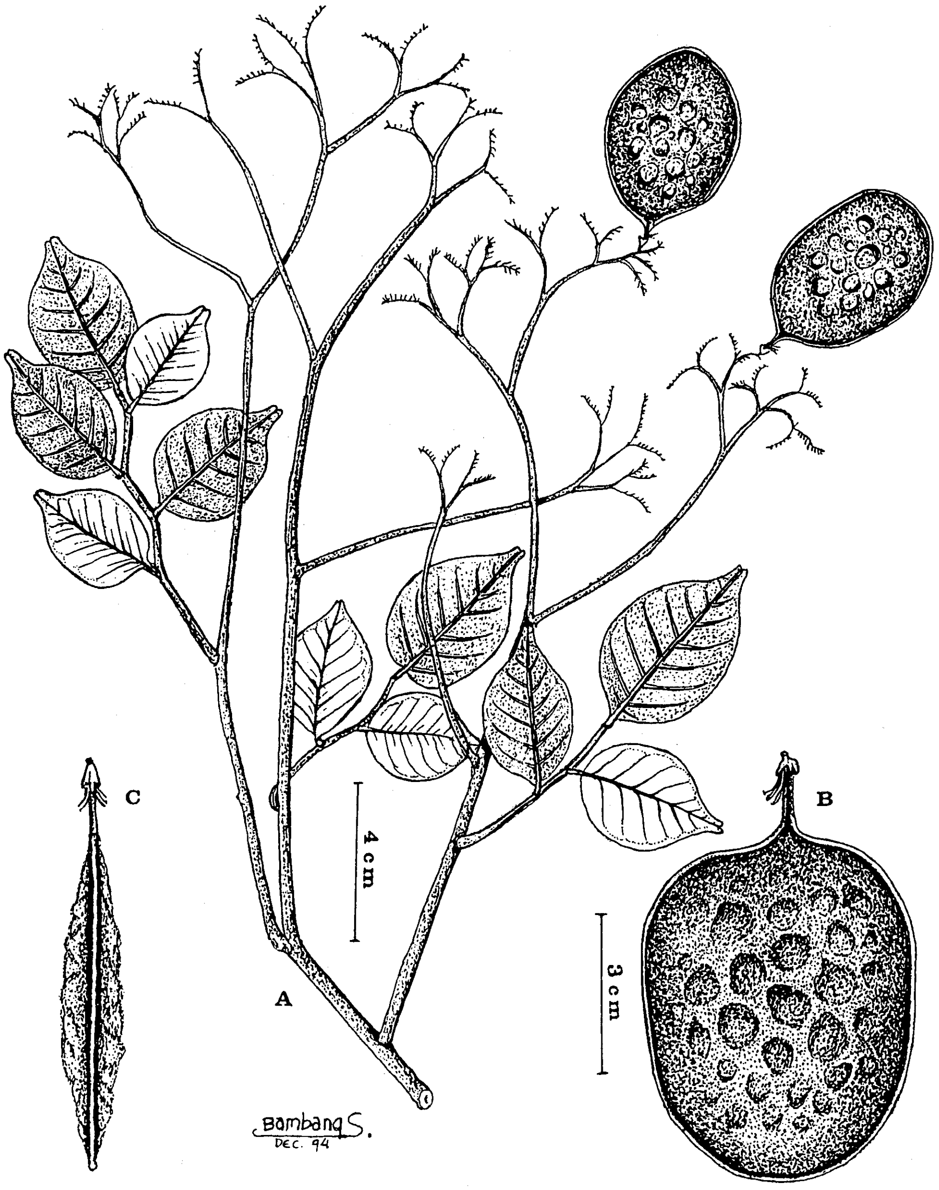

Fig. 1. *Dalbergia bintuluensis* Sunarno & H. Ohashi. A. Branch with mature fruits. B. Fruit, C. Adaxial view of fruit. Voucher: Ilyas Paie S. 15593, holotype.

20. Leaves 5–10 cm long. Leaflets suborbicular, sometimes obovate elliptic. Pods samaroid, partly thickened on seeds, surface smooth and obscure reticulation ....6. *D. discolor*

Enumeration of *Dalbergia* in Borneo

1. **Dalbergia beccarii** Prain in J. Asiat. Soc. Beng. **70** (2): 64 (1901), & in Ann. Roy. Bot. Gard. Calc. **10**: 33, t. 6A (1904); Verdc., Man. New Guin. Leg. 293 (1979). Type: Borneo, Sarawak. fr., Nov. 1871 (Beccari 566, **Lectotype** designated here: K).

D. insularis Pulle in Lorentz, Nov. Guin. **8**: 377 (1910). Type: New Guinea. Irian Jaya, Bivak. fl. & fr., 13 July 1907 (Versteeg 1117 Holo-: L; Iso-: BO, K).

D. novo-guinensis Merr. & Perry in J. Arn. Arb. **23**: 402 (1942). Type: Papua New Guinea, Maira, Vailala river. fl. & fr., 21 Feb. 1926 (Brass 1031, Holo-: A; Iso-: L, K).

Distribution: **Borneo** (Brunei, Kalimantan and Sarawak) (Fig. 3A). New Guinea, and Peninsular Malaysia.

Habitat and ecology: Usually in swampy forests along river, margin of monsoon forests on river banks, or in beach forests; 0 to 30 m in altitude. Flowering February to July; fruiting February to November.

Field notes: Erect or scandent shrubs or lianas. Main stems are reported sometimes with long thorns (Prain 1904).

Specimens examined:

Brunei. Seria Belait, on the shore. fl. & young fr., June (van Niel 4014, L).

Kalimantan. Sungai Sambas. fr., 1893/1894 (Hallier 1069, BO, L); Sungai Landak, Kapuas (Teijsmann s.n., BO).

Sarawak, unknown exact locality. fr., Nov. (Beccari 566, Lectotype: K); (Beccari 1105, K); S. Segan Bintulu. fr., Oct. (Anderson S-18580, K, L).

2. **Dalbergia bintuluensis** Sunarno & H. Ohashi, sp. nov. (Fig. 1).

Differt haec species a *D. albertisii* Prain foliis 3–5-foliolatis (vs. 5–9-foliolatis in *D. albertisii*) foliolis plus minusve cuspidatis et leviter retusis ad apicem leguminibus late oblongis 5–6 cm longis alveolatis, a *D. kostermansii* Sunarno & H. Ohashi foliis 3–5-foliolatis (vs. 5–7-foliolatis in *D. kostermansii*) foliolis apice mucronulatis leguminibus longioribus alveolatis.

Liana ligna. Folia 3–5-foliolata, foliola elliptica vel late ovata, 25–40 mm longa, 12–25 mm lata, subtus sparse puberula vel glabra, infructescentiae compositae paniculatae 8–11 cm longae. Legumina late oblonga 5–6 cm longa 3–4 cm lata conspicua alveolata.

Type: Borneo. Sarawak. Segan Forest Reserve, Bintulu. fr., Nov. 1961 (Ilyas Paie S. 15593, Holo-: L, photo TUS; Iso-: BO, K).

A woody climber; young branches slender, striate, glabrous or sparsely puberulent, without lenticels. Stipules caducous. Leaves 3–5-foliolate, 9–13 cm long, the axis more or less zigzag; petioles 0.8–1.0 cm long, inconspicuously striate, glabrous; rachis 0.7–2 cm long, glabrous. Leaflets coriaceous, ovate to broadly ovate, 2.5–4 cm long and 1.2–2.5 cm broad, obtuse or rounded at base, more or less cuspidate at apex but slightly retuse at very top; dark brown, glabrous, dull or slightly glossy on upper surface; paler, sparsely addressed puberulent or glabrous on lower surface; midrib prominent beneath, lateral nerves 4–6 pairs; petiolules 2–3 mm long, glabrous. Inflorescences not known. Infructescens terminal and axillary, compound paniculate, 8–11 cm long; peduncles 4–5 cm long, striate, glabrous; rachis ca. 3 cm long, striate; bracts persistent, ovate ca. 1.0 mm long. Pods broadly oblong, 5–6 cm long, 3–4 cm wide, blackish brown, slightly glossy, conspicuously alveolate on lateral surfaces; stipes ca. 3 mm long.

Distribution: Endemic to **Borneo** (Sarawak). (Fig. 2)

Habitat and ecology: Known only the type specimen. Climbing on *Dryobalanops* in a primary forest.

Taxonomic notes: The new species is similar to *Dalbergia albertisii* Prain from New Guinea in having compound panicles and entirely thickened pods, but is distinguished by its 3–5-foliolate leaves (against 8–9-foliolate in *D. albertisii*), and larger pods (against 5–6 × 3–4 cm large against 2.5–4 × ca. 2 cm large in *D. albertisii*) with distinctively alveolate surfaces (against finely reticulate in *D. albertisii*). Also, the new species is similar to *D. kostermansii*, a new species described in this paper, in leaflets, but they differ in leaves and pods which will be pointed out in the note under the latter species. For detailed comparison between these three species are shown in

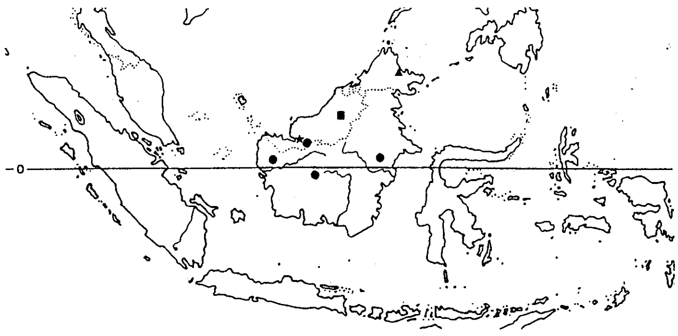

Fig. 2. Distribution map of four new species of *Dalbergia*. *D. bintuluensis* (★), *D. kostermansii* (●), *D. richardsii* (■), and *D. sandakanensis* (▲).

Table 2.

3. **Dalbergia borneensis** Prain in J. Asiat. Soc. Beng. **70** (2): 44 (1901), & in Ann. Roy. Bot. Gard. Calc. **10**: 75, t. 57 (1904). Type: Borneo, Sarawak, Kuching (Haviland 2889, Holo-: K; Iso-: L).

Distribution. Endemic to **Borneo** (Sarawak) (Fig. 3A).

Habitat and ecology: In secondary lowland heat forests or sometimes in sandstone hill forests. Flowering and fruiting probably in March to August.

Field notes: Scandent shrubs or lianas up to 5 m high. Inflorescences and new shoots with flush of leaves appear simultaneously. This habit is similar to that of *Dalbergia velutina* Benth. Calyx green, corolla white, and style white.

Taxonomic notes: Prain (1901) described the ovary is glabrous except the stipe, but the type sepcimen has finely puberulous pistils. *Dalbergia borneensis* seems to be close to *D. velutina* Benth.

Specimens examined:

Sarawak. Batang. fr., Apr. (Brooke 8306, L); Kuching. fl., March and fr., Apr. 1893 (Haviland 2889, Type, K, L); Bintulu, Kalong. fl., Apr. 1893 (Haviland 2890, K, L); Mt. Dulit, Ulu Tinjar, near Kapa, IVth Div., in a secondary forest, under 300 m altitude. fl., Aug. 1932 (Richards 1215, K, L); Beyond uplands, 3 miles south of Kuching, secondary forest on degraded soil. fl, March (Anderson S-23492, K, L).

4. **Dalbergia candenatensis** (Dennst.) Prain in J. Asiat. Soc. Beng. **70** (2): 49 (1901); Thothathri, Tax. Rev. Dalbergieae Ind. 187 (1987); Sunarno & Ohashi in J. Jpn. Bot. **71**: 243 (1996).

Distribution: India to South China and to North Australia through Malesia. In Malesia, **Borneo** (Brunei, East Kalimantan, Sabah, and Sarawak) (Fig. 3B), and Malay Peninsula eastwards to New Guinea, Solomon Isl., New Caledonia and Fiji Islands.

Habitat and ecology: See Sunarno and Ohashi in J. Jpn. Bot. **71**: 243 (1996).

Vernacular names: Tuba-tuba or Kalong (Dyak, Brunei).

Specimens examined:

Brunei. Kp. Menumbok, Mempakul. fl., July 1932 (Goklin BNB-1965, BO, K, OXF); Telisai bridge, Tutong district. fl., May (van Niel 3924, L); Telisai river. fl., July (van Niel 4187, L).

Kalimantan. Nunukan, Sungei Simengkadu, North of Tarakan. fl. & young fr., Nov.–Dec. 1953 (Meijer 2376, BO, L).

Sabah. Pulau Bahagan, Kunak District. fl., July (Madan SAN 90770, K); Sepilok Forest Reserve, Elopura, Sandakan. fl., Dec. (John BNB A-639, K); Near T.B. Ward miles 2, Labuk road. fl., June (Pimtu SAN 5684, K); Jalan Pangkalan, Sepilok For. Res. fl., Aug. (Patrick SAN 65650, K, L).

Sarawak, no exact locality (Beccari 2126, K); Kp. Likas, Inaman. fl., July (BNB 1993, BO, K); Bintulu, Kalong. fl., Apr. (Haviland 2892, BM, BO, K, L); Kampung Puah, Sematan, in secondary forests. fl., Sept. (Purseglove & M. Shah 4633, K, L).

5. **Dalbergia canescens** (Elmer) Merrill, Enum. Phil. Fl. Pl. **2**: 295 (1923).

Table 2. Comparative morphology of *Dalbergia albertisii*, *D. bintuluensis*, and *D. kostermansii*

Species/ Characters	*D. albertisii* Prain	*D. bintuluensis* Sunarno & H. Ohashi	*D. kostermansii* Sunarno & H. Ohashi
Leaf	5–9-foliolate	3–5-foliolate	5–7-foliolate
Leaflet	ovate, narrowly oblong to oblong, acute at apex;	ovate to broadly ovate, cuspidate at apex;	
lateral nerves	10–13 pairs	4–6 pairs	5–7 pairs
Bracteole	caducous		persistent
Flower	3.5–4.5 mm long		ca. 3 mm long
Calyx	2–2.5 mm long, entirely glabrous;		ca. 2 mm long, glabrous except the margin;
lowest tooth	ca. 1.5 mm long, acuminate at apex		ca. 1 mm long, obtuse to acute at apex
Standard	oblong to subobovate;		broadly obovate;
claw	0.7–0.8 mm long		ca. 0.3 mm long
Wing	narrowly oblong, 2–2.5 mm long;		oblong, 1.5–1.7 mm long;
claw	0.7–0.8 mm long		ca. 0.4 mm long
Keel-petal	boat shaped, 2–2.5 mm long;		subovate, ca. 1.8 mm long;
claw	0.6–0.7 mm long		ca. 0.4 mm long
Pistil	ca. 2 mm long;		1.5–1.6 mm long;
ovary	glabrous except on both sutures		sparsely hairy
Pod	elliptic to suborbicular, ca. 1.5 cm long;	broadly oblong, 5–6 cm long;	suborbicular to broadly oblong, 3–4 cm long;
lateral surface	finely reticulate	alveolate	smooth

Derris canescens Elmer in Leafl. Phil. Bot. **8**: 3087 (1919). Type: Philippine. Luzon. Mt. Maquiling, Los Banos, Laguna. fl., June–July, 1917 (A.D.E. Elmer 17883, Iso-: BO).

Distribution: **Borneo** (Sabah: Mt. Kinabalu) (Fig. 3B) and the Philippines.

Habitat and ecology: A mountain forest species. Usually in foothill forests at altitude up to 1000 m. Flowering in June, July, and September; fruiting in September.

Field notes: A large and quite strong woody climber. Flowers sometimes white with purple spots.

Taxonomic notes: This species is similar to *Dalbergia hoseana* Prain and *D. sandakanensis* Sunarno & H. Ohashi, a new species described

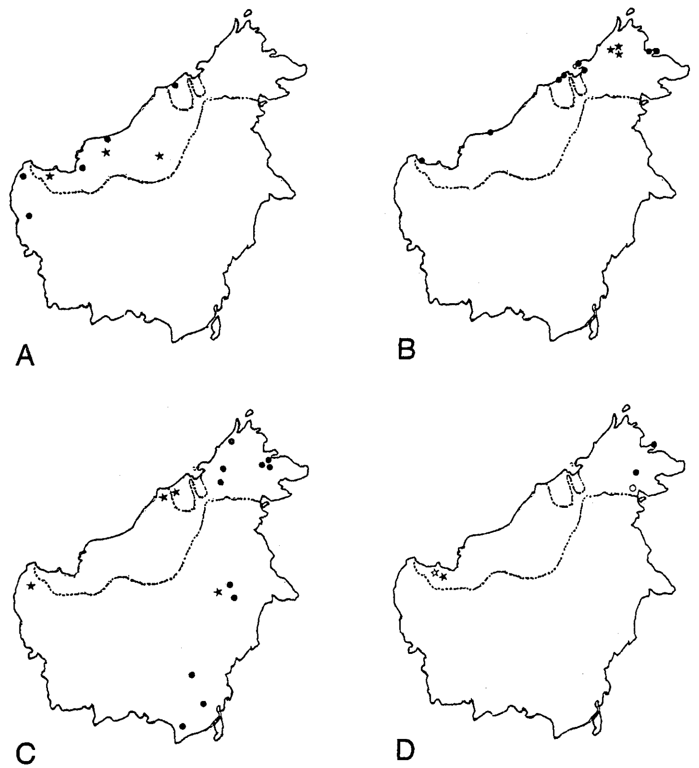

Fig. 3. Distribution maps of *Dalbergia* in Borneo 1. (A): *D. beccarii* (●) and *D. borneensis* (★), (B): *D. candenatensis* (●) and *D. canescens* (★), (C): *D. discolor* (●) and *D. falcata* (★), (D): *D. ferruginea* (●), *D. havilandii* (☆), *D. hoseana* (★), and *D. mimosella* (○).

in this paper (Tab. 4).

Specimens examined:

Sabah. Mt. Kinabalu, Dallas, via Duran at 1000 m in altitude. fl., Sept. 1931 (J. & M. S. Clemens 26265, BO, K), fl., Sept. 1931 (J. & M. S. Clemens 26439, BO, K, L); Mt. Kinabalu, via Duran at 1000 m altitude. fr., Sept. 1931 (J. & M. S. Clemens 26507, BM, BO, K).

6. **Dalbergia discolor** Blume ex Miq., Fl. Ind. Bat. **1**: 130 (1855); Sunarno & Ohashi in J. Jpn. Bot. **71**: 243 (1996).

Distribution: **Borneo** (Kalimantan and Sabah) (Fig. 3C), Sulawesi, and the Philippines.

Habitat and ecology: See Sunarno & Ohashi in J. Jpn. Bot. **71**: 243 (1996).

Vernacular names. Belangan (Indonesian); Sambustelat (Dyak); Tada, Akar lakka (Kutei); Ipil Baram, Pulingi (Dusun).

Specimens examined:

Borneo, no exact locality (Korthals s.n. HLB. 908. 114-1439, L), (Korthals s.n. HLB 908. 114-1423, L).

Kalimantan. Gn. Pamatton (Korthals s.n. HLB 908. 114-1433 L); Along Mahakam river, West Kutei. fl. & young fr., July 1925 (Endert 1448, BO, L); 5 km by Labuhan, West Kutei. fr., Aug. 1925 (Endert 1893, BO, L). Sei Gosong Mas. fl., Sept. 1930 (Haring b.b. 14499, BO, L); Amuntai. (Jenar b.b. 18673, BO, L); Pleihari, Djilatan. (Kaderi b.b. 19257, BO, L); Pleihari, Djilatan. fl., Oct. 1934 (Kaderi b.b. 19258, BO, L).

Sabah. Tambunan, in swampy area. fr., Aug. (Umbol NBFD 5404, K, L); Jalan Ulu Tomani, Tomani, Tenom district (Rundi SAN 43191, K); Mile 87.5, Hap Seng logging area, Telupid. fl. bud, July (Leopold & Toha SAN 83596, K, KEP, L); Kampung Mausaralong, mile 56.5, Tambunan district. fr., Aug. (Abas SAN 85910, K, KEP, L); Sungei Tilid, 2 miles from Ulu Tomani, Ten Sun. fr., July (Madani SAN 97057, K, L); Ulu Temani, Tenom. fr., July (Sundalin SAN 80091, K, KEP, L); Kitau, Keningan district, side of Tambunan, Keningan road. fr.,

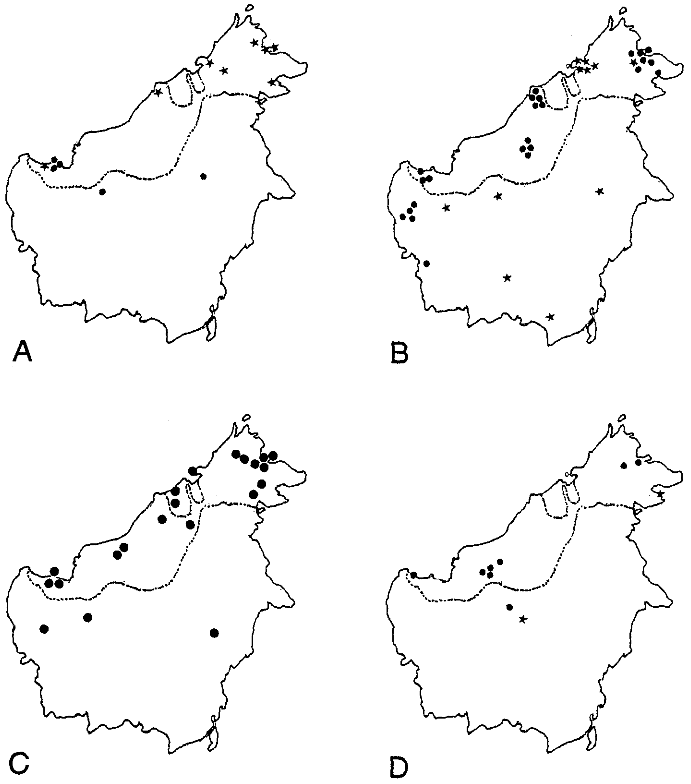

Fig. 4. Distribution maps of *Dalbergia* in Borneo 2. (A): *D. hulletti* (●) and *D. junghuhnii* (★), (B): *D. parviflora* (●) and *D. pinnata* (★), (C): *D. rostrata* (●), and (D): *D. scortechinii* (●) and *D. velutina* (★).

Sept. (Amin SAN 95460, K, L); Kpg. Kapuakan, Lubut, Sugut. young fr., Apr. (Aban & Dewol SAN 96629, K, L).

7. **Dalbergia falcata** Prain in J. Asiat. Soc. Beng. **70** (2): 65 (1901), & in Ann. Roy. Bot. Gard. Calc. **10**: 104 (1904). Type: Borneo. Sarawak: Bintulu. fr., 1865–1868 (Beccari 4027, Holo-: K) (Fig. 5).

Woody climbers, up to 6 m tall, stems angular, blackish to grayish brown, rusty pubescent; stipules triangular to lanceolate, ca. 3 mm long, ca. 1 mm wide, rusty pubescent, early caducous. Leaves 5–9-foliolate, 10–20 cm long, petioles 4–10 cm long, rachis 6–10 cm long. Leaflets ovate, 5–7.5 cm long, 2–3 cm wide; dark green and glabrous above, paler and finely appressed pubescent beneath; subcoriaceous, rounded at base, abruptly acuminate at apex; petiolules 5–8 mm long; lateral main nerves 5–7 in each half-leaflet. Inflorescences axillary paniculate, 4–7.5 cm long; peduncles 1–4 cm long, puberulent; branches puberulous; bracts lanceolate ca. 2 mm long, caducous; bracteoles lanceolate, ca. 1 mm long, pubescent, early caducous. Flowers 8–9 mm long; pedicels 1–2 mm long, densely rusty pubescent. Calyx bell-shaped, 3–4 mm long, densely rusty pubescent, tube ca. 2 mm long; the lowest lobe acuminate, ca. 2 mm long, edges of the lobes with glandular hairs. Standard reflexed; the blade orbicular, 5–6 by 5–6 mm large, subhastate at base, broadly emarginate at apex, reticulately veined; the

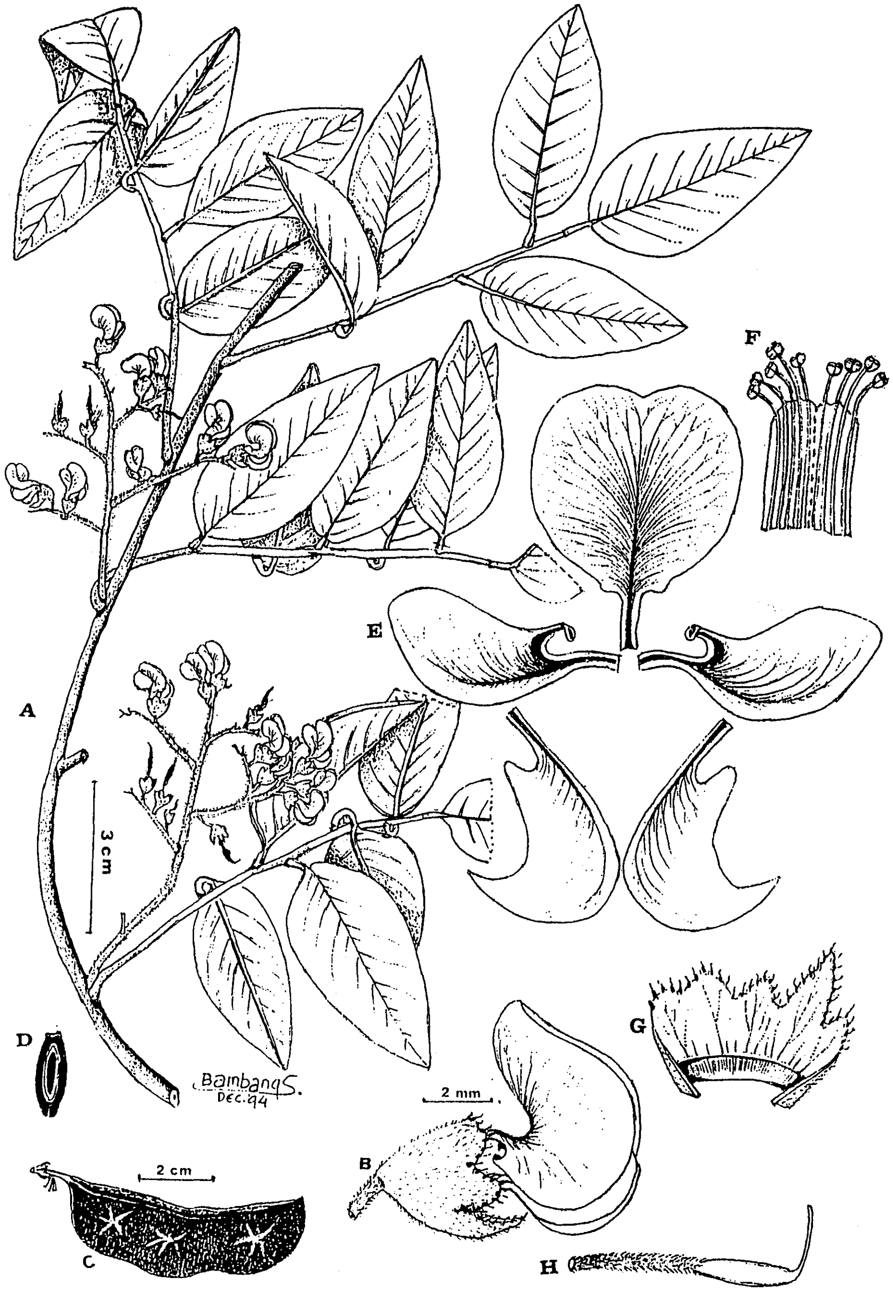

Fig. 5. *Dalbergia falcata* Prain. A. Flowering branch, B. Flower, C. Pod (lateral surface), D. Pod (transverse section), E. Petals, F. Connate stamens, G. Calyx opened, H. Pistil. Voucher: A–B, E–H Ashton BRUN 5556; C–D Hallier 1170.

claw ca. 1.5 mm long. Wings: the blade oblong, slightly falcate, ca. 5 by 3–3.5 mm large, rounded or bluntly obtuse at apex; the claw 1.5–2 mm long. Keels: the blade boat-shaped, ca. 3 by ca. 4 mm large, bluntly obtuse at apex; the claw 1.5–2 mm long. Stamens 10, monadelphous but the vexillary one soon becoming free; the united part of filaments ca. 4 mm long, the upper free part of filaments alternately short of ca. 1.5 mm and longer of ca. 2 mm. Ovary 2–2.5 mm long, glabrous; stipe 2.5–3 mm long, densely puberulous; style ca. 2 mm long, glabrous; stigma small; ovules 2–4. Pods indehiscent, entirely thickened, firm, falcate, 2.5–7 cm long, 1.5–2 cm wide, 0.5–0.7 cm thick, dark brown to blackish brown with irregularly cracked on lateral surfaces and upper suture, finely puberulous but glabrescent. Seeds 1–4, reniform, compressed, 1.5–2 by 0.5–0.7 cm large, blackish brown, shinning.

Distribution: Endemic to **Borneo** (Brunei, Kalimantan, and Sarawak) (Fig. 3C).

Habitat and ecology: In primary forests, along river banks, at 50–75 m in altitude. Flowering in April and September.

Taxonomic notes: This species was described by Prain (1901, 1904) without characters of flower petals. Specimens Hose 578 (L) and Ashton BRUN 5556 (L) were similar to *D. falcata* in vegetative characters, but the flowers are similar to *D. kunstlerii* Prain from Malaya. These finding convinced us that these are flowering specimens of *D. falcata*.

Specimens examined:

Brunei. S. Damit, Belait. fl., Apr. 1959 (Ashton BRUN-5556, L).

Kalimantan. West Kutei, by Long Petah. fl., Sept. (Endert 3504, BO); S. Sambas fr. 1893–94 (Hallier 1170, BO, L).

Sarawak. Baram district. fl., Apr. 1894–95 (Hose 578, L).

8. **Dalbergia ferruginea** Roxb., Fl. Ind. **3**: 228 (1832); Sunarno & Ohashi in J. Jpn. Bot. **71**: 243 (1996).

Distribution: Malesia and Australia (N. Queensland). In Malesia, **Borneo** (Sabah and Sulawesi) (Fig. 3D), Papua New Guinea, and the Philippines.

Prain (1904) doubted the occurrence of *D. ferruginea* in Banggi island (Fraser 274), because it was an East Malesian element which never crossed the Wallace's line to the West. There are, however, three collections are known in Sabah at present as cited below.

Habitat and ecology: See Sunarno and Ohashi in J. Jpn. Bot. **71**: 244 (1966). In open habitat, the plant is an erect shrub up to 3 m tall or a liana up to 7 m tall, but in dense forests it becoming up to 20 m high.

Vernacular names: Akar langsa (South Segaluid).

Specimens examined:

Sabah. Tangkulap (Arsat BNB 1328, K, OXF); Pangkalan Bangi. fl., Aug. (Fraser 274, K); Elopura, Segaluid, Sandakan. fl., May (Kadir NBFD A-2802, K, L).

9. **Dalbergia havilandii** Prain in J. Asiat. Soc. Beng. **70** (2): 45 (1901) & in Ann. Roy. Bot. Gard. Calc. **10**: 60, t. 35B (1904). Type: Borneo, Sarawak, near Kuching. fl., Apr. 1893 (Haviland 2894, **Lectotype** designated here, K).

Distribution: Endemic to **Borneo** (Sarawak) (Fig. 3D).

Taxonomic notes: Prain (1904) suggested that this species is a small tree and placed the species near to *D. hullettii* which he thought near to *D. rostrata* based on similarity in inflorescence and number of leaflets. However, based on flower characters we think it may be nearer to *D. velutina* than to *D. rostrata*.

Specimen examined: Sarawak near Kuching. fl. March 1894 (Havilandi 2894, Lectotype, K and 2895, Syntype, K).

10. **Dalbergia hoseana** Prain in Ann. Roy. Bot. Gard. Calc. **10**: 67 (1904). Type: Borneo, Sarawak, Kuching. fl., 30 Oct. 1894 (Haviland & Hose 3375, Holo-: K, Iso-: A, BM, BO, L).

Distribution: Endemic to **Borneo**: Sarawak (Fig. 3D).

Taxonomic notes: Prain (1904) stated that this is close to **Dalbergia malabarica** Prain from India. The stipules are apparently similar to those of *D. canescens*.

Specimen examined: The type specimens.

11. **Dalbergia hullettii** Prain in J. Asiat. Soc. Beng. **66** (2): 119 (1897), & op. cit. **70** (2): 45 (1901), & in Ann. Roy. Bot. Gard. Calc. **10**: 59, t. 35A (1904); Ridley, Fl. Mal. Penins. **1**:

590 (1922). Type (n.v.): Singapore, Thompson road, 5 miles from Singapore, in swampy scrub jungle. fl., Feb. 21, 1855 (R. W. Hullett 626, Holo-: probably SING).

Distribution: **Borneo** (Sarawak and East Kalimantan) (Fig. 4A), and Singapore.

Habitat and ecology: In heat forests or swampy scrubs. Flowering in July to September. A specimen found to grow in rocky sandstone habitat. Leafless on full flowering or sometimes several young leaves flushed.

Field notes: An erect shrub or small tree in open areas or a woody climber up to 25 m in dense forests. Flowers creamy.

Taxonomic notes: Prain (1904) suggested that the species was closely related to *D. havilandii*.

Specimens examined:

Sarawak. Tanjong po head land, Bako National Park. fl. bud, 19 June 1984 (Ching S 42176, K, KEP, L); 3 miles south of Kuching. fr., March 1966 (Anderson S 23492, K, L).

Kalimantan. West Kutei, by long Petah. fl., Sept. (Endert 3504, BO).

12. **Dalbergia junghuhnii** Benth. in Miq., Pl. Jungh. **1**: 254 (1851) & in J. Linn. Soc. **4**. Suppl.: 33 (1860); Baker in Fl. Brit. Ind. **2**: 233 (1879); Prain in J. Asiat. Soc. Beng. **66** (2): 115 (1897), & in Ann. Roy. Bot. Gard. Calc. **10**: 40, t. 14 (1904). Type: Sumatra, Batak Lands, Padang lawas, at ca. 1000 m altitude (Junghuhn 233, Holo-: K, Iso-: L.).

D. phyllanthoides Blume ex Miq., Fl. Ind. Bat. **1**: 134 (1855); Prain in J. Asiat. Soc. Beng. **70** (2): 60 (1901), & in Ann. Roy. Bot. Gard. Calc. **10**: 44, 19 (1904); Ridley, Fl. Mal. Pen. **1**: 590 (1922), syn. nov. Type: Java. (Blume s.n. HLB. 909.84-167, Lecto-: L).

Distribution: **Borneo** (Sabah and Sarawak) (Fig. 4A), Sumatra, Peninsula Malaysia, and Java.

Habitat and ecology: Usually in primary or secondary forests; along river or in forest margin, sometimes on rocky areas, limestone hills, grass fields, dry areas or at sea shore; 1–800 m in altitude.

Specimens examined:

Sarawak, unknown exact locality (Motley 32, K); Lio Matu, Baram district. fl., Nov. (Moultob 41, K); Bukit Kepayang, Jesselton, alt. ca. 150 m. fl. & fr., May (M. Shah & Kadim MS 1007, BO, K, L).

Sabah. Shang Lian unlogged area, Nabawa district. fl., Aug. (Fidilis & Sumbing SAN 109946, K); near Sandakan, alt. ca. 30 m. fl., June (Keith NBFD 7230, K, KEP, L); Kabili, Sepilok For. Res., Sandakan. fr., July (Matusop NBFD 7421, K, KEP); Ulu Sungei Kun Kun (Gibot SAN 97204, BO, K, KEP); Km 97, Sungei Kaingaran, Beluran district, on hill ridge between Ulu Sungai Kaingaran & Sungai Tungud. fl., July (SAN 99278, K, KEP, L).

13. **Dalbergia kostermansii** Sunarno & H. Ohashi, sp. nov. (Fig. 6).

Species haec ab *D. albertisii* Prain differt leguminibus longioribus late oblongis laevibus, foliis 5–7-foliolatis ovatis vel late ovatis nervis lateralibus 5–7-jugis.

Frutex erectus vel scandens ad 5 m altus in loco aperta vel liana ligna ad 25 m altus in sylva densa, folia 5–7-foliolata, foliola ovata vel late ovata, 3.5–7 cm longa, 1.5–3.5 cm lata. Inflorescentiae terminales paniculatae 9–3 cm longae, flores ca. 3 mm longi, pedicelli 0.5–1 mm longi. Legumina incrassata mesocarpiis suberosis late oblonga, 3–4 cm longa, 2–3 cm lata.

Type: Borneo. East Kalimantan. central Kutei, Sg. Mahakam, river bank near Samarinda (Kostermans 6129, Holo-: L, photo TUS; Iso-: L, BO, K).

An erect or scandent shrub, up to 5 m high in open places, or climber in dense forests, up to 25 m high; young branches, slightly striate, sparsely puberulent, older branches blackish brown, conspicuously striate, glabrous and slightly lenticellate.

Stipules caducous or rarely subpersistent, triangular, obtuse at apex, 1.0–1.5 mm long, sparsely appressed puberulent. Leaves 4–8 cm long; petioles 1.5–3 cm long, sparsely appressed puberulent or glabrescent, striate; rachis 2.5–5 cm long. Leaflets 5–7, ovate to broadly ovate, 3.5–7 cm long, 1.5–3.5 cm wide, coriaceous or firmly chartaceous, obtuse, rounded or slightly cordate at base, more

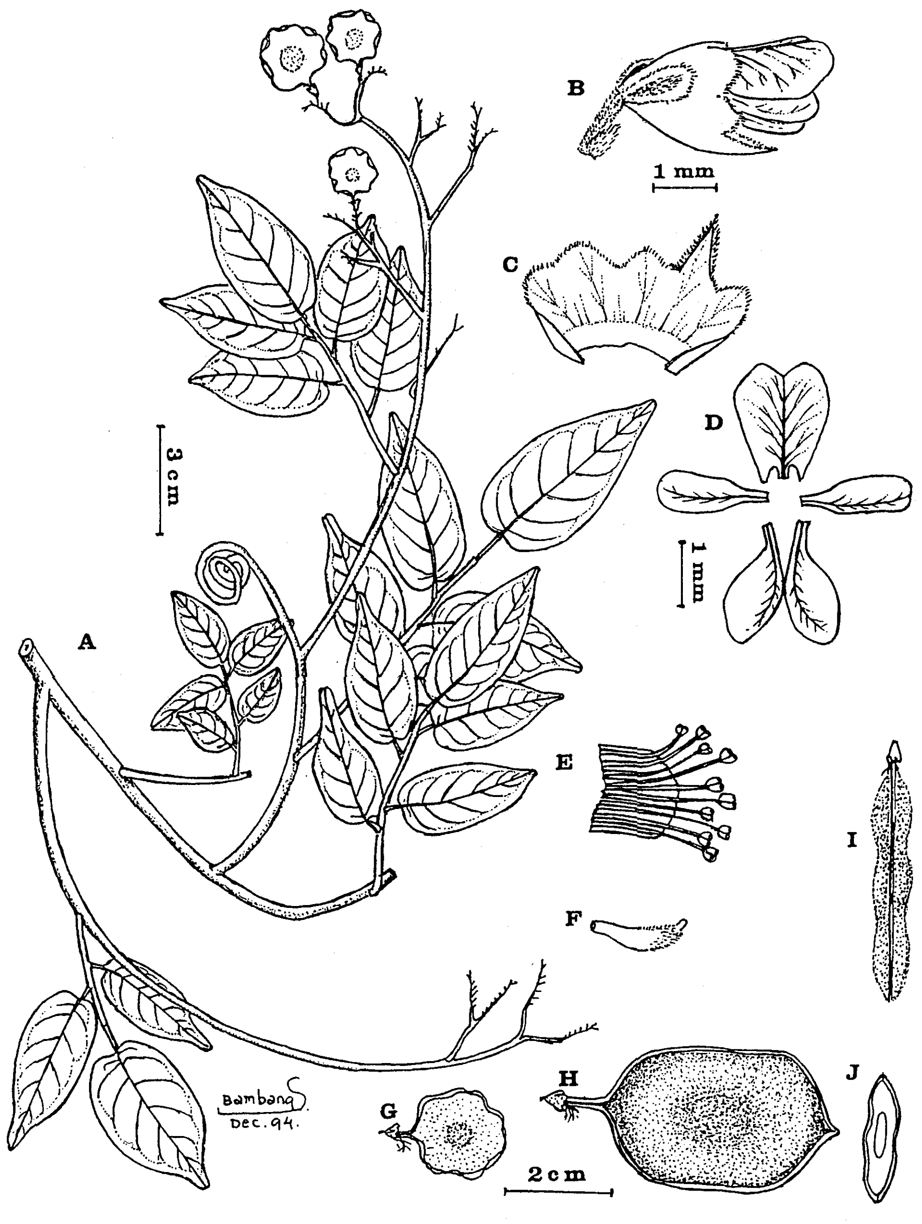

Fig. 6. *Dalbergia kostermansii* Sunarno & H. Ohashi. A. Branch with young fruits, B. Flower, C. Calyx opened, D. Petals, E. Connate stamens, F. Pistil, G. Young fruit, H–J. Pod, H. lateral, I. adaxial, J. transverse section. Voucher: (A–G) Kostermans 6129 holotype & (H–J) Mogea 3733.

or less cuspidate at apex and mucronulate at very top; upper surface dark brown, slightly glossy, sparsely white appressed puberulent to more or less glabrous; lower surface paler, sparsely short appressed white puberulent, midrib prominent, lateral nerves 5–7-pairs; petiolules 2–3 mm long.

Inflorescences terminal, paniculate, 9–13 cm long, sparsely appressed white short puberulent or almost glabrous; bracts caducous or subpersistent, broadly ovate, ca. 1 mm long, sparsely puberulent; bracteoles persistent, ovate, sparsely puberulent.

Flowers white or pale green, ca. 3 mm long; pedicels 0.5–1 mm long, rather densely puberulent. Calyx green when fresh, campanulate, ca. 2 mm long, tube ca. 1 mm long, glabrous except on the margin, lowest lobe obtuse to slightly acute, ca. 1 mm long. Standard erect, broadly obovate, 2.2–2.5 mm long, ca. 2.0 mm wide, hastate to sagittate at base, rounded or emarginate at apex, claw ca. 0.3 mm long. Wings oblong, 1.5–1.7 mm long by ca. 0.5 mm wide, attenuate at base, rounded at apex; claw ca. 0.4 mm long. Keel-petals subovate, ca. 1.8 mm long by 0.7–0.8 mm wide; attenuate at base, rounded or obtuse at apex, claw ca. 0.4 mm long. Stamens 9–10, monadelphous, united part ca. 1 mm long, free part of filaments alternately 0.4 or 0.6 mm long. Pistil 1.5–1.6 mm long, scarcely puberulent, yellow in fresh, stipe ca. 0.4 mm long; style ca. 0.2 mm long; ovules 1–2.

Pods entirely thickened, with suberose mesocarp, broadly oblong, 3–4 cm long, 2–3 cm wide, not reticulate-veined, blackish brown, slightly glossy when dry. Seeds unknown.

Distribution: Endemic to **Borneo** (Central Kalimantan and Sarawak). (Fig. 2)

Habitat and ecology: A shrub up to 5 m high in open area and becoming a strong liana up to 25 m tall in a dense forest. In riverine forests in hill sides, usually growing well in loamy or yellowish rich soil; 200–250 m in altitude.

Taxonomic notes: This new species is similar to *D. albertisii* Prain from New Guinea in inflorescences and pods and to *D. bintuluensis* Sunarno & H. Ohashi described in this paper in stipules and flowers as shown in Table 2. From *D. albertisii*, *D. kostermansii* is distinct in having longer (3–4 cm long), broadly oblong, smooth pods (against suborbicular, 1.5 cm long, reticulately veined pods in *D. albertisii*), 5–7-foliolate leaves (against 8–9-foliolate leaves in *D. albertisii*), leaflets with cuspidate apex and 5–7 pairs of secondary veins. From *D. bintuluensis*, this new species differs in having 5–7-foliolate leaves with mucronulate leaflets (against 3–5-foliolate and retuse leaflets in *D. bintuluensis*) and 3–4 cm long fruits (against 5–6 cm long in *D. bintuluensis*).

A flowering specimen, Hallier 1158, was identified by Hallier as a species of *Hippocratea* of Celastraceae, but the specimen belongs to *Dalbergia* because stamens of the specimen have small obovate to slightly globular anthers with short transverse slits.

The specific epithet is dedicated in honor of the late Dr. A.J.G.H. Kostermans of Herbarium Bogoriense, who devoted his life for study on flora of Malesiana.

Specimens examined:

Kalimantan. S. Sambas. fl., 1893/1894 (Hallier 1158, BO); central Kutei, Sg. Mahakam, river bank near Samarinda. yg. fr., Aug. 1951 (Kostermans 6129-Type); upper Katingan, Mendawai river area, Samba river, Bukit Raya, 60–80 m altitude. Tumbang Samba, ca. 8 km from the base camp at Tumbang Dahiya fr. Nov. 1982 (Mogea 3733, Bo, K, L).

Sarawak. Kg. Sebatong Ulu Merit, Kapit, third Division, October (Paie S. 28800, BO, K, KEP, L); Sungai Segan, 4 miles south of Bintulu. fl., Oct. (S. 18571, K, L); Ulu Sungei Belaga, 7th Div., on rich soil of riverine. young fr., 7 Oct. 1981 (Othman et al. S 43525, K, KEP, L); Sungei Sepaku, Belaga, 7th Div., on rich yellow soil. fl., June (Othman et al. S. 43835, K, KEP, L); Ulu Sungei Sepaku, Ulu Belaga, Kapit 7th Div., in riverine forests. fr., Nov. 1981 (Othman et al. S. 43879, K, KEP, L).

14. **Dalbergia mimosella** (Blanco) Prain in Ann. Roy. Bot. Gard. Calc. **10**: 42 (1904); Sunarno & Ohashi in J. Jpn. Bot. **71**: 244 (1996).

Distribution: **Borneo** (Sabah) (Fig. 3D), Sulawesi, Sumatra, and the Philippines.

Habitat and ecology: See Sunarno & Ohashi in J. Jpn. Bot. **71**: 244 (1996).

Specimen examined:

Sabah. Sandakan; Hiew Sing logged area, Coupe, Kalabakan district. fr., Aug. (F. Krispinus SAN 95927, K, L).

15. **Dalbergia parviflora** Roxb. [Hort. Beng. 98 (1814), nom. nud.]; Fl. Ind. **3**: 225 (1832); Miq., Fl. Ind. Bat. **1**: 132 (1855); Benth. in J. Linn. Soc. **4**, Suppl. 33 (1860); Prain in J. Asiat. Soc. Beng. **66** (2): 127 (1897);

& op. cit. **70** (2): 63 (1901); Beccari, Nelle For. di Borneo 358 (1902); Prain in Ann. Roy. Bot. Gard. Calc. **10**: 34 (1904); Thothathri, Tax. Rev. Dalbergieae Ind. 191 (1987). Type (n.v.): Moluccas, Roxburgh s.n. (G).

Distribution: Burma, Indo-china (Laos and Thailand), and Malesia. In Malesia **Borneo** (Brunei, West Kalimantan, Sabah, and Sarawak) (Fig. 4B), Sumatra, the Philippines, Peninsula Malaysia, and Moluccas.

Habitat and ecology: Usually in secondary forests on river bank or along the sea shore, in fresh water swamp forests, or in *Dipterocarpus* forests; on rich yellow soils, clay soils or alluvial soils; from the sea level up to 150 m in altitude. Flowering and Fruiting in March, April, August and October.

Field notes: An erect or scandent shrub in open areas or a strong woody climbers up to 30 m high in dense forests. The stems brown; barks smooth, pale brown; sapwoods yellowish or pale yellow. Peduncles, pedicels and calyx green, petals pale green, stamens bright yellow, and pistils yellowish.

Vernacular names: Takanas bini (Dyak Beruni); Tooku-tooku (Sungei, Dyak Sandakan); Kayu lakkah (Dyak); Garu lakka (Dyak); Dorilak, Lake (Orang Sungei, Borneo).

Specimens examined:

Brunei. Near entrance to Jalan Bukit Puan, Sungei Belait, in river bank. fr., Aug. (Patrick SAN 61551, KEP, L); about a half of mile above Bukit Puan, Sungei Belait, in river bank (Sinclair SF. 10512, K, L); Belait river, Belait. fl. & young fr., Jun (van Niel 4641 & 4641, B, L).

Kalimantan. Ketapang, Pontianak, May–June 1925 (B. de Yong bb. 8326, BO); Pleihari. fl. & fr., Oct. (A. Kadri bb. 19257 & 19258, BO); Kuala, Pontianak (J. v. de Yong bb. 32243, BO, L); Sungei Kapuas (Jaheri s.n., BO); Pontianak (Teijsmann s.n., BO); Sungai Landak (Teijsmann s.n., BO).

Sabah. Pin river. fr., Sept. (Arsat BNB 1243, K, OXF); Tanjong Bulat. young fr., Nov. (Arsat BNB 1249, K);Tanah Bundo. fl., Apr. 1926 (Coklin BNB 2450, BO); Beaufort. fr., Aug. 1932 (Bakar BNB 2471, BO, K, OXF); Elopura, Sandakan. young fr., Oct. (A. Cuadra BNB A, 1027, BO); Suar, Lamba, Elopura. fr., Nov. 1939 (Puasa & Luggoh BNB 10617, BO, L); Bukit Kretretam Concession area, Cpt. 15, BN Timber Co, Lahad Datu. fl., May (Wood SAN 4846, KEP, L0; Sungei Binuang Camp, Kretam, Sandakan district (Singh SAN 30670, K, L); Sepilok Forest Reserve. fr., Sept. (Meijer SAN 58686, K, L); Near entrance to Jalan Hujong Tanjong, Cpt. 13, Sepilok Forest Reserve, Sandakan Bay. fr., Aug. (Sam SAN 61551, K); Ulu sungei Pin, Kinabatangan, Lamag District. fr., Sept. (Madani SAN 90983, K); Kapili, Sepilok Forest Reserve, Elopura For. District. fl. bud, Apr. (Enggoh NBFD 10213, K, L).

Sarawak, unknown exact locality (Beccari 2149, K), (Beccari 3589, K); 5 km upstream from Long Luyut, near Long Palau, 4th Div., young fr., Aug. (Fuchs 21225, K, L); Redan river, Baram District. young fr., Nov. (Hose 325, BM, K, L); Baram district. fl., Apr. (Hose 595, BM, K, L); Baram district. fl., Apr. (Hose se 663, K); Kuching. fr., Sept. (Ridley 12464, K); Nanga Mawang, Sungei Karap, Baram district. fr., Sept. (Anderson S. 30706, K, L); Sungei Taniku, Lower Baram Forest Reserve, 4th Div. fl., May (O. Bin Ismawi S. 32025, K, L).

16. **Dalbergia pinnata** (Lour.) Prain in Ann. Roy. Bot. Gard. Calc. **10**: 48 (1904); Thothathri, Tax. Rev. Dalbergieae Ind. 114 (1987); Sunarno & Ohashi in J. Jpn. Bot. **71**: 245 (1996).

Distribution: India, Indo-China, Malesia, and S. China. In Malesia, **Borneo** (Kalimantan, Sabah, and Sarawak) (Fig. 4B), Java, Peninsular Malaysia, the Philippines, Sulawesi, and Sumatra.

Habitat and ecology: In lowland to mountain forests, 0 to 1700 m in altitude. See Sunarno & Ohashi in J. Jpn. Bot. **71**: 245 (1996).

Vernacular names: Akah mahadoko (Dyak); Omot (Dyak, Kanangsian dusun).

Specimens examined:

Borneo, not exact locality (Korthals s.n., K, L).

Kalimantan. Permatang, south of Kuala Kayan, Sampit river. fl., Jan. (Alston 13266, BM, BO, K); Foot of Mt. Kelam, Mt. Knepai (Hallier 1626, K, L, P); Bandjarmasin. (Korthals s.n., L); Kutei, along Bekayan river. fl. & fr., Apr. (Kostermans 10347, K, L); Bukit Raya, in a primary forest. fl., Jan. (Noteboom 4522, BO, K, L); Batu Badingding, in a primary. forest. fl. & young. fr., Feb. (Veldkamp 8544, BO, L).

Sabah. Bintang Mas Logging Co. area, Karamak, Lamag. fl., June (Madani SAN 81772, K, L); Miles 75.5, Telupid road, Sandakan. fl. & fr., Aug. (Gibot SAN 91261, K); Bukit Sungaru, Weston, Beaufort Distr. fr., June (Bidin SAN 80576, K, KEP, L); Mile 24, Sook Plantation, Keningau. fl. & fr., Aug. (Madani SAN 87153, K, L).

Sarawak. Rejang, Sillo, Kalong. fl., Aug. (Haviland 2888, BM, K); Mt. Buan, limestone. fl., Dec. (Haviland 2027, K); Kimanis (Taha BNB 2012, K); Kanangsian. fl. & fr., March. (Goklin BNB 2050, K); Kuala Penyu, Mempakul, level land on a secondary forest. fl., Oct. (Tandon BNB 4230, BO, K); Diwata forest res., Lahat Datu, primary forest (Sinanggu SAN 39977, K, L).

17. **Dalbergia richardsii** Sunarno & H.

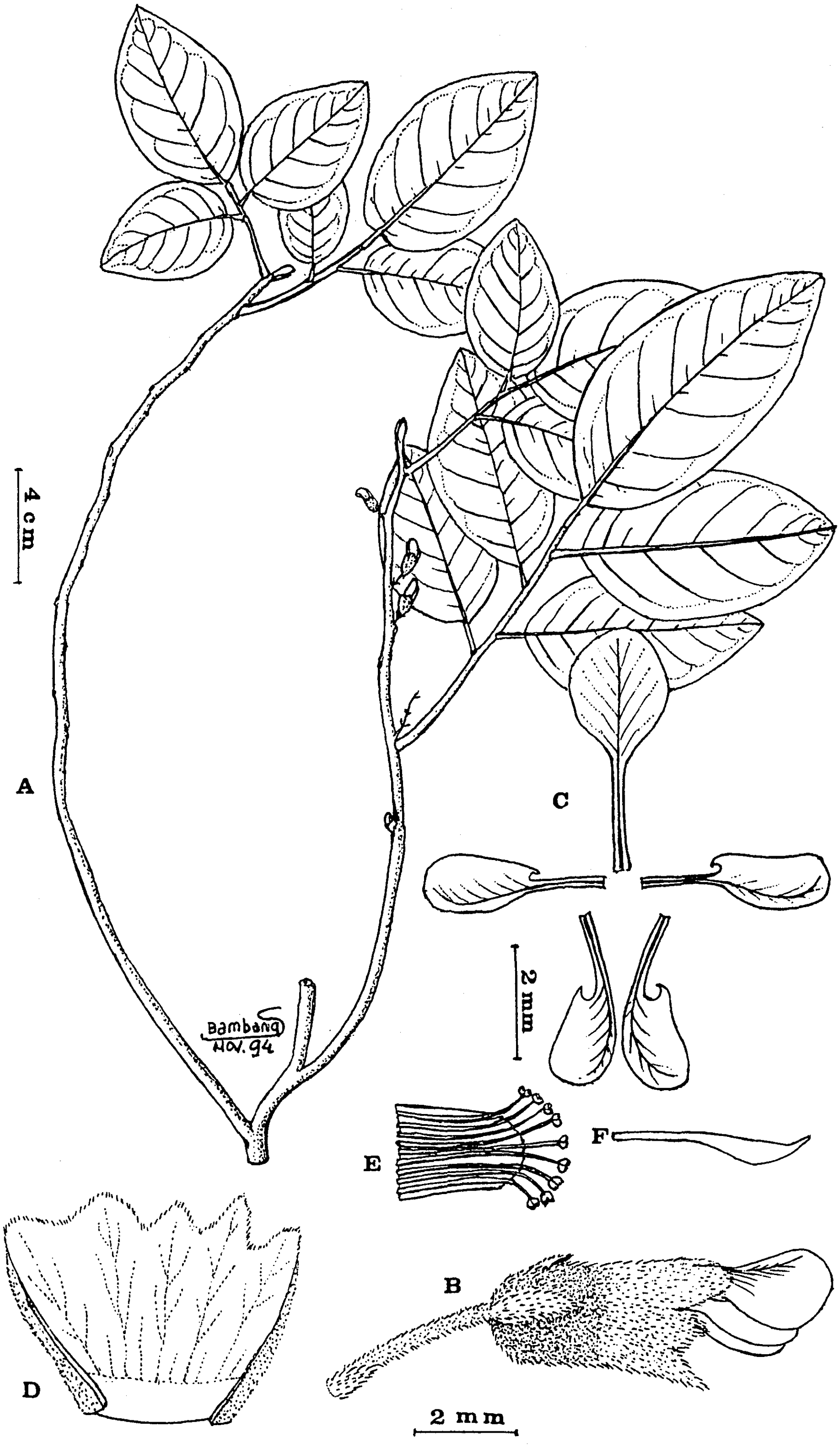

Fig. 7. *Dalbergia richardsii* Sunarno & H. Ohashi. A. Flowering branch, B. Flower, C. Petals, D. Calyx opened, E. Connate stamens, F. Pistil. Voucher: Richards 1527.

Table 3. Difference between *Dalbergia borneensis*, *D. richardsii*, and *D. rostrata*

Species/ Characters	*D. borneensis* Prain	*D. richardsii* Sunarno & H. Ohashi	*D. rostrata* Hassk.
Stipule	lanceolate, 5–6 mm long, subpersistent	ovate, ca. 3 mm long, caducous	broadly ovate, ca. 1 mm long, early caducous
Leaflet	5–11, 25–30 × 10–15 mm, apex obtuse	3–5, 30–100 × 20–60 mm, apex acuminates	(1–)3–5, 40–180 × 20–90 mm, apex rounded to obtuse
Inflorescence	paniculate	1–3 fasciculate or racemose	paniculate
Bracteole	caducous, narrowly ovate or subulate, ca. 1 mm long	persistent, triangular ovate, ca. 2 mm long	early caducous, narrowly ovate to linear, ca. 1 mm long
Flower	5.5–6.5 mm long	ca. 7.0 mm long	6–7 mm long
Calyx	ca. 4 mm long, obtuse at base	ca. 5 mm long, gibbous at base	3.5–4.5 mm long, obtuse at base
Standard	ca. 6.5 mm long, emarginate at apex	ca. 5 mm long, rounded at apex	6–6.5 mm long, emarginate or rounded at apex
Wing	ca. 3.5 mm long	2–2.5 mm long	3–3.5 mm long
Keel-petal	2.7–3 mm long	ca. 2 mm long	ca. 3 mm long
Pistil	6–7 mm long;	5.5–6.0 mm long;	5–5.5 mm long;
ovary	densely hairy;	glabrous;	densely hairy;
style	1–1.5 mm long	ca. 0.5 mm long	1.5–2 mm long

Ohashi, sp. nov. (Fig. 7).

A *Dalbergia borneensi* Prain foliis 3–5-foliolatis foliolis bracteolis et floribus (ca. 7 mm longi vs. in *D. borneensi* 5.5–6.5 mm longi) magnoribus, a *D. rostrata* inflorescentiis racemosis vel fasciculatis (vs. in *D. borneensi* et *rostrata* paniculati), bracteolis minoribus, calycibus basigibbosi differt.

Liana ligna, folia 3–5-foliolata, foliola ovata vel elliptico-oblonga 3–10 cm longa 2–6 cm lata apice obtusa vel rotundata. Inflorescentiae racemosae vel fasciculatae cum 1–3-flores. Flores 6–7 mm longi, vexillum refractum ca. 5 mm longum apice retundatum, stamina 9–10 monadelpha, pistillum 5.5–6 mm longum glabrum. Legumen ignotum.

Type: Borneo. Sarawak: IV Div. Ulu Tinjar, near Long Kapa, Mt. Dulit, fl. Aug. 1932 (Richards 1527, Holo-: L, photo in TUS; Iso-: BO, K).

A large woody climber; young branches stout, glabrous to sparsely pubescent, scantly lenticellate, shallowly ridged downwards; stipules caducous, ovate, ca. 3 mm by 2 mm large; puberulent. Leaves 5–10 cm long, petioles 2–3 cm long, sparsely short hairy; rachis 3–7 cm long. Leaflets 3–5, coriaceous to subcoriaceous, ovate or elliptic-oblong, 3–10 cm long, 2–6 cm broad, obtuse to rounded at base, acute at apex, blackish brown and glabrous above; paler and glabrous beneath; midrib prominent beneath, glabrous; lateral nerves 5–8 in each half of leaflet; petiolules 3–5 mm long.

Inflorescences axillary, 1–3-flowered fasciculate or racemose, ca. 1 cm long, surrounded by scaly bracts at base; bracts ovate, persistent; bracteoles subpersistent, triangular ovate, ca. 2 mm long, pubescent. Flowers yellowish white, 6–7 mm long; pedicels ca. 4 mm long, rusty puberulent. Calyx bell-shaped, gibbous at base, ca. 5 mm long, densely rusty puberulent; tube ca. 4 mm long, lowest lobe triangular, ca. 1 mm long. Standard refractive, blade suborbicular, wider than long, ca. 2.0 mm long by ca. 2.5 mm wide; subhastate at base, rounded at apex, reticulately veined; claw ca. 3 mm long. Wings blade oblong, 2.0–2.5 by 1.5–1.8 mm; subhastate at base, rounded at apex; claw ca. 3 mm long. Keel blade oblong, ca. 2.0 mm by 1.5–1.8 mm large; auriculate, rounded at apex; claw ca. 3 mm long. Stamens 9–10, monadelphous, united part of filaments ca. 4 mm long, free part 0.7–0.8 mm long. Pistils 5.5–6.0 mm long, glabrous; stipe 2.5–3.0 mm long; style ca. 0.5 mm long, stigma small; ovules 1–2. Pods unknown.

Distribution: Endemic to **Borneo**, known only from the type specimen (Fig. 2).

Habitat and ecology: A hill forest climber growing in primary forests on spurs of mountains, ca. 700 m in altitude.

Field notes: A climber on a tall tree, flowering at about 6 m or more from ground upwards.

Taxonomic notes: The new species is characterized by 3–5-foliolate leaves and large flowers about 6–7 mm long with a gibbous calyx about 5 mm long. It is similar to *D. borneensis* Prain in habit, but leaves, inflorescences, bracteoles, and flowers of both species differ clearly as shown in Table 2. This species is also similar to *D. rostrata* Hassk. in leaves, i.e., number (1–5-foliolate) and size of leaflets, number of lateral nerves (7–10 pairs) and size of flowers (6–7 mm long), but, differences in both species are in inflorescences, bracteoles, and calyx as shown in Table 2.

18. **Dalbergia rostrata** Hassk. in Fora 25, Beibl. **2**: 53 (1842); Sunarno & Ohashi in J. Jpn. Bot. **71**: 245 (1996).

D. simplicifolia Merr. in Phil. J. Sci. Bot. **11**: 87 (1916). Type: Borneo, Sarawak, Miri, fl. Apr. 1895 (Hose 678, Holo-: L; Iso-: BM, BO, K).

D. pseudosissoo Miq., Fl. Ind. Bat. **1**: 128 (1855), nom. illeg.: Thothathri, Tax. Rev. Dalbergieae Ind. 67 (1987).

Distribution: Sri Lanka, S. India, Indo-China (perhaps in Thailand and Cambodia), and Malesia. In Malesia, **Borneo** (Brunei, Kalimantan, Sabah, and Sarawak) (Fig. 4B) and west to East Malesia except New Guinea.

Habitat and ecology: See Sunarno and Ohashi in J. Jpn. Bot. **71**: 246 (1966).

Vernacular names: Lankit (Dusun Tambunan, Sepilok, Dyak).

Specimens examined:

Brunei. Seria, Belait, swampy forest. fl., Aug. (Van Niel 4067, L); Seria, Belait, Swampy forest. fl., Apr. (Van Niel 4461); Belait river, Belait. fl., Apr. (Van Niel 4633, L).

Kalimantan, unknown exact locality (Korthals s.n./HLB. 908.114-1388, L); Kutei, Mahakam near Samarinda. fl., Aug. (Kostermans 6130, BO, L); Sungei Smittouw (Hallier 1273, BO, K, L); Wowogei, Kenara (Hallier 1371, BO, K, L); Sungei Knepai (Hallier 2165, BO, K, L); Gn. Pamotan (Korthals s.n./ HLB. 908.114-1384, L).

Sabah. Sandakan: Dallas, via Dusan, Kinabalu. fl., Sept. (J. & M.S. Clemens 26531, BM); Penibukan ridge jungle. fl., Sept. (J. & M.S. Clemens 40366, BM, K, L); Sungei Temburong, Temburong district. fl., March (Smithies et al., SAN 17393, A, BO, BRI, K, L); Penibukan ridge, Kinabalu Mt. (J. & M.S. Clemens 40450a, BM); Bukit Serudong, Tawao District. fl., Sept. (Abu Bakar SAN 23054, K, L); Sepilok Forest Res., Forest

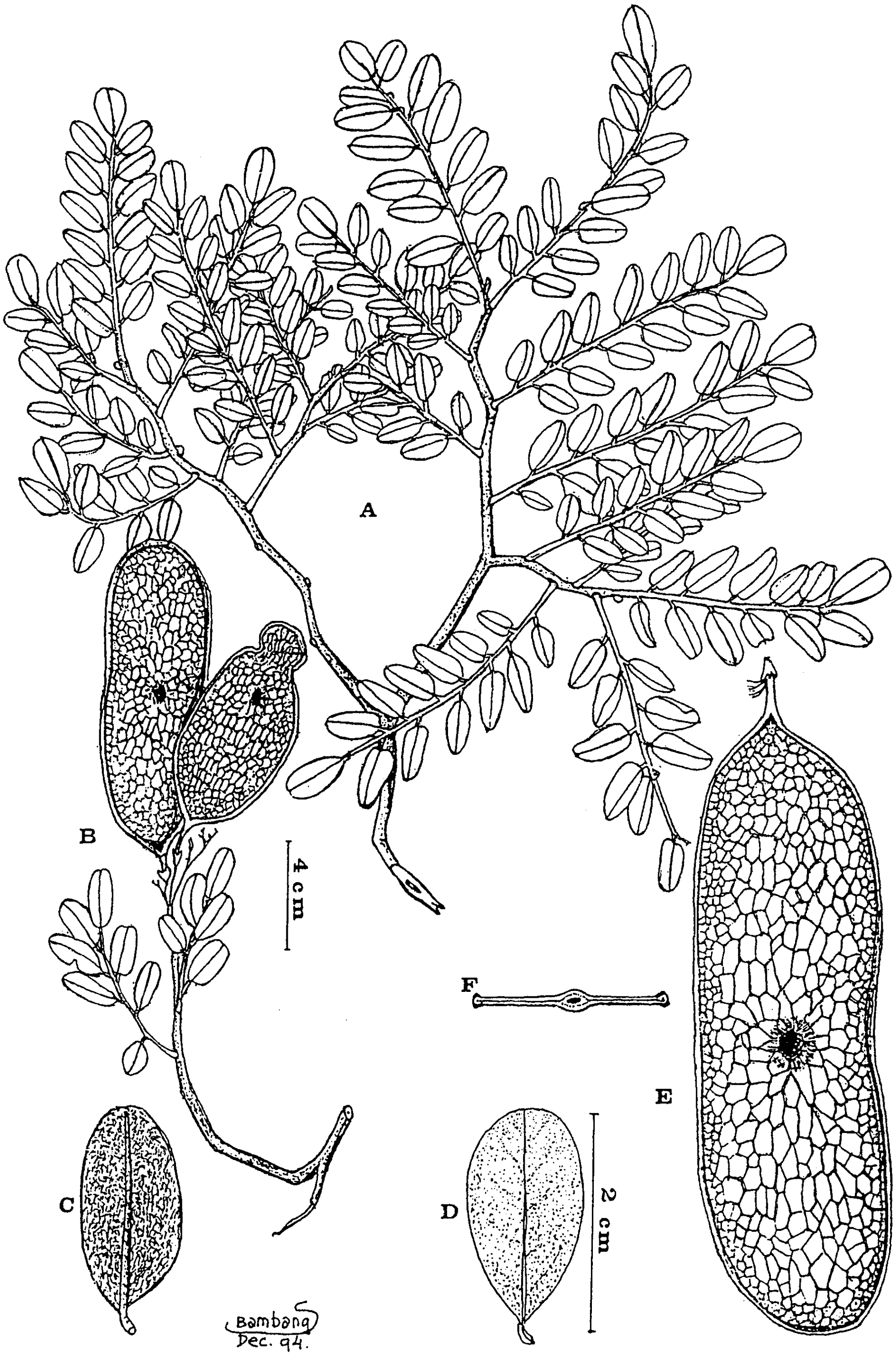

Fig. 8. *Dalbergia sandakanensis* Sunarno & H. Ohashi. A. Sterile branch, B. Branch with pods, C. Lower surface of leaflet (densely hairy), D. Upper surface of leaflet (sparsely short hairy), E. Fruit, F. Cross section of fruit. Voucher: Ramos Bur. Sci. 1883.

Table 4. Difference between *Dalbergia canescens* and *D. sandakanensis*

Species/ Characters	*D. canescens* Merrill	*D. sandakanensis* Sunarno & H. Ohashi
Stipule	ovate to lanceolate, 5–10 mm long, densely hairy	suborbicular, ca. 1 mm long, glabrous
Leaf	15–21-foliolate	9–17-foliolate
Leaflet	20–30 mm long, 10–15 mm wide, rounded at apex;	10–20 mm long, 8–12 mm wide, obtuse at apex;
lateral nerves	distinct, 6–9 pairs	obscure
Bracteole	linear, 2–2.5 mm long	broadly ovate, ca. 1 mm long
Pod	oblong, 5–7 cm long, 1.5–2 cm wide, attenuate at base, acute at apex; style persistent	oblong to broadly oblong, 9–12 cm long, 3–3.5 cm wide, rounded decurrent at base, rounded at apex; style caducous

Dep. Elopura. fl., Oct. (Kadir NBFD A-544, BO, K); Sepilok Forest Res., near landing place. fl., Oct. (Meijer SAN 23054, BO); Sepilok Forest Res. On short ridge, east of main ridge. fl., Sept. (Patrick SAN 39666); Near camp, Sepilok Forest Res. (Patrick SAN 39676, L); Jaln Pangkalan, Sepilok Forest Res. fl., Aug. (Patrick SAN 64741, K, L); Sepilok Forest Res. fl., Aug. (Ampon & Simbut SAN 74282, K, L); Agriculture Ulu Duam. fl., June (Tarodop SAN 87981, K, L); Ulu sungei Brantian, Germinsam, Brantian, Tawao. fl., Apr. (Sigin et al. SAN 96409, K, L); Sungei Kuntun. fl., June (Aban SAN 97074, ANS, K, KEP, L, UKMB); Bettoian. fl., Aug. (SF 19119, BM, BO, K).

Sarawak: not exact location. (Beccari 3908, K); around Long Selatong Gn. Lepo, Baram district, 4th Div. fl., March (Chin 2834, L); Kuching. fl., Jan. (Havilland 2095, BM, K); Santubong. fl., Sept. (Havilland & Hose 3277, BM, K, L); Kuching. fl., June (Havilland & Hose 3284, K); Baram district. fl., Apr. (Hose 678, BM, BO, K, L. Type of *Dalbergia simplicifolia* Merrill); North slopes of Mt. Penrissen (South of Kuching), primary forest. fl., Aug. (Jacobs 5069, K, L); Bukit Raya, Kapit, ca. 600 m altitude, mixed *Dipterocarpus* Forest (Chai S 18918, K, L); Batang Mersing, Anap, basalt hill side mixed Dipt. forest, ca. 400 mm altitude. fl., 24/Aug./64, (Sibat Ah Luang S 21935, Bo, K, KEP, L); Semi Layar F. R., Bintulu. fl. bud, Sept. (Ilias Pa S 32047, BO, L); Buan For. Res., Bintulu. fl., Sept. (Cha S 32114, BO, K, L); Tanjong Long Amok, Sungei Eusungei, Ulu Medamit, Limbang, 5th Div. fl., June (George S 43061, K, KEP, L).

19. **Dalbergia sandakanensis** Sunarno & H. Ohashi, sp. nov. (Fig. 8).

Dalbergia canescens Merrill primo adspectu maxime simile, sed stipulis suborbicularibus 0.6–1 mm longis glabris, foliis 9–17-foliolatis foliolis brevius apice obtusis nervis lateralibus obscuris, leguminibus oblongis vel late oblongis 9–12 cm longis 3–3.5 cm latis basi et apice rotundis, stylo caducis.

Liana ligna, folia 9–17-foliolata, foliola elliptica vel oblonga, 10–20 mm longa, 8–12 mm lata apice obtusa vel rotundata. Inflorescentiae paniculatae vel compositae corymbosae. Legumina samaroidea, membranacea, oblonga vel late oblonga, 9–12 cm longa, 3–3.5 cm lata, reticulato-venosa.

Type: Borneo. Sabah. Sandakan and vicinity. fr., Sept.–Dec. 1920 (Ramos Bur. Sci. 1883, Holo-: L, photo TUS; Iso-: BO, K).

A woody climber up to 15 m tall; branches tough, terete, densely rusty pubescent when young, becoming sparsely brown hairy, striate or slightly fissured and white lenticellate on old branches.

Stipules caducous, suborbicular, 0.6–1 mm large, glabrous. Leaves (9–)11–15(–17)-foliolate, densely rusty pubescent, 5–13 cm long, petioles 1–1.5 cm long; rachis 4–8 cm long. Leaflets chartaceous, elliptic to oblong, 10–20 mm long by 8–12 mm broad, obtuse to rounded at both ends, rather oblique, slightly apiculate, without a tuft of hairs at the very apex; upper surface sparsely brown hairy, dark brown when dry; lower surface densely brown hairy, paler than the other when dry; midrib conspicuous, densely hairy; lateral nerves inconspicuous; petiolules 0.5–1.0 mm long.

Inflorescences axillary, densely brown short hairy, paniculate or compound corymbose, lax-flowered; bracts caducous, narrowly ovate, ca. 1 mm long, densely rusty pubescent; pedicels subsessile or shortly 0.5–1.0 mm long, densely rusty puberulous; bracteoles persistent, broadly ovate, ca. 1 mm by 0.7 mm large, sparsely rusty puberulent or glabrous. Flowers only seen in bud. Calyx campanulate, glabrous or ciliate on lobes. Stamens 9, monadelphous.

Pods samaroid, membranous, oblong to broadly oblong, 9–12 cm long by 3.0–3.5 cm broad, yellowish brown in dry, with reticulate veins; base rounded, decurrent; rounded at apex; style deciduous; stalk 2–5 mm long, glabrous. Seeds not seen.

Distribution: Endemic to **Borneo**. (Fig. 2)

Habitat and ecology: Found in damp forests at low altitude.

Taxonomic notes: The new species seems to be close to *Dalbergia canescens* Merrill which was found in North Borneo and the Philippines in having leaves with many small leaflets and thinly samaroid pods, but, they are distinguished from each other by stipules, leaves, and fruits as shown in Table 3. It is distinguished particularly by its large pods (9–12 cm long and 3–3.5 cm wide) from *D. velutina* Benth. which has pods 5–7.6 cm long and 1.5–1.8 cm wide and from *D. borneensis* Prain of which the pod, according to Prain (1904), is 5.7–6 cm long and about 2 cm wide.

20. **Dalbergia scortechinii** (Prain) Prain in J. Asiat. Soc. Beng. **66** (2): 444 (1897), & in Ann. Roy. Bot. Gard. Calc. **10**: 40, t. 15 (1904).

Distribution: **Borneo** (Kalimantan, Sabah and Sarawak) (Fig. 4D), Bangka, Peninsular Malaysia, and Sumatra.

Habitat and ecology: A lowland forest species, usually in a secondary forest on sandy loamy soils or sandstone substratum in 50–200 m altitude. Flowering in June, September and December.

Vernacular names: Pirasak (Dyak, Munut Bokan).

Field notes: A climbing shrub up to 25 m high. Flowers odorless, calyx green, corolla greenish white, filaments pale green, anthers orange, and pistil green.

Specimens examined:

Kalimantan. Blac Oc. (Jaheri 1465, BO).

Sabah. Mile 87.5, Hap Seng Logging area, Telupid, Sandakan district. fl., June (SAN 83596, K, KEP, L).

Sarawak. Middle Napagun, damp forest, ca. 100 m altitude. fl., June (Keith BNB 9205, K, L); Rejang. fl., 1893 (Haviland 2893, BO, K, L); Left bank of Rejang river, ca. 10 Km below Belaga Segaham range, by Belaga air field, sandstone 3rd Div. Kapit district, Belaga subdistrict. fl., Sept. (Jacobs 5452, BO, K, L); Kampung Pueh, Sematan, secondary thicket, ca. 30 m altitude fl. bud Sept. (Purseglove & M. Shah no. P.4828, K, L).

Taxonomic notes:The species is very close to *D. junghuhnii*, but it could easily be distinguished, especially in the field by its vegetative characters also in the slightly differences in generative parts.

21. **Dalbergia velutina** Benth. in Miq., Pl. Jungh. **1**: 255 (1851), & in J. Linn. Soc. **4**. Suppl. 43 (1860); Prain In J. Asiat. Soc. Beng. **66** (2): 117 (1897) & op. cit. **70** (2): 43 (1901), in Ann. Roy. Bot. Gard. Calc. **10**: 74, t. 55 (1904); Ridley, Fl. Mal. Penin. **1**: 592 (1922);

Thothathri, Tax. Rev. Dalbergieae Ind. 99 (1987). Type. Sylhet. Holo-: Wallich 5868B (K-W).

Distribution: India (Assam), Bangladesh, Myanmar, eastwards to Indo-China, and Malesia. In Malesia, **Borneo** (Kalimantan and Sabah) (Fig. 4D) and Peninsular Malaysia.

Habitat and ecology: Usually along margin of lowland to hill forests; 5–700 m in altitude.

Field notes: An erect or scandent shrub to 4 m tall in open place, or a liana in a dense forest up to 10 m tall. Usually the outer bark dark gray or shiny silvery gray and dark purple to dark brown in young parts, smooth or rough with cracked when old; sapwoods whitish, heartwoods contain a dark reddish liquids. Flowers fragrant, calyx pale green, and leaflets yellowish green or bluish green above, greenish white or pale green below.

Taxonomic notes: Prain (1901) recognized var. *maingayi* Prain (1897) based on several specimens including Haviland 1444 (K). In the field, the variety differs mainly in the hairiness of leaflets and young branches.

Specimens examined:

Kalimantan, not exact location (Jaheri 1759, BO); Liang gagang. fl., 1893–1984 (Hallier 2951, BO).

Sabah. Gays isl. fl., Aug. (Haviland 1444, K).

Unknown species

Dalbergia sp.

A woody climber; young branches terete, glabrous to or rather densely brown puberulent. Leaves 1-foliolate, broadly oblong or ovate, 5–7 cm long, 4–5 cm wide, obtuse at apex, firmly coriaceous, glabrous above, densely appressed short brown puberulent below, prominently reticulate beneath; lateral nerves 8–10 pairs; petiolules 0.4–0.5 cm long, densely puberulent. Inflorescences axillary paniculate, up to 4 cm long; bracts caducous; bracteoles linear, ca. 1 mm long. Calyx in young flowers 3–4 mm long, densely rusty puberulent, tube ca. 3 mm long; lobes subequal, the lowest longer then others, ca. 1 mm long.

Habitat and ecology: On white sandy soil, at 8 m in altitude. Flowering in September.

Taxonomic notes: A specimen, Purseglove & M. Shah P.-4416 (L), may represent a new species. It is similar to *D. rostrata* Hassk. and *D. havilandii* Prain in number of the leaflets, but differs by shape of leaflets and terminal inflorescence.

Specimen examined:

Sarawak. Penrisson road, miles 6, Kuching. fl. bud, Sept. (Purseglove & M. Shah P.-4416, L).

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スナラノ[a]，大橋広好[b]：**ボルネオ島のマメ科ツルサイカチ属植物**

マレーシア植物区系地域のマメ科の中でツルサイカチ属は最も分類学的研究の遅れている分類群の1つであり，この地域全体の種類が扱われている研究はPrain (1901, 1904)によるアジア産種のモノグラフ以外にはない．マレーシア地域の中でもボルネオ島は種類が多く，これまでにボルネオ島からはPrain (1904)やMerrill (1921)によって16種が報告されていた（表1)．本研究では，主にボゴール（BO)，キュー（K)，ライデン（L）各植物標本館所蔵の押し葉標本に基づいて研究した結果，21種を認めた（表1)．このうち14種はPrain (1904)がすでに報告した種と同じもので，11種については学名も同じであり，3種では学名が変更された．新しく加えられた7種は4新種および3新分布種（2種はフィリピン，1種はシンガポールに知られていた）であった．

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